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FEDERAL COMMUNICATIONS COMMISSION
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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)
) MM Docket No. 97-217
Amendment of Parts 1, 21 and 74 to)
Enable Multipoint Distribution Service) RM-9060
and Instructional Television Fixed Service)
Licensees to Engage in)
Fixed Two-Way Transmissions)

EX PARTE COMMENTS OF CLARITY WIRELESS, INC.

Clarity Wireless, Inc. ("Clarity") hereby submits the following *ex parte* comments in response to the Commission's Notice of Proposed Rulemaking ("Notice") in the above-captioned proceeding, and respectfully requests that they be considered by the Commission.

I. CLARITY'S INTEREST IN THIS PROCEEDING

Clarity was founded to develop breakthrough wireless data communications products for the computer networking and Internet service markets. Clarity's wireless modem technology is the result of four years of research and development leading to revolutionary new digital signal processing ("DSP") and radio frequency ("RF") techniques that Clarity believes will set new performance and cost standards in wireless communications. Clarity's initial products will communicate at ten times the data rate of today's state-of-the-art wireless LAN products.

Existing MDS and ITFS two-way digital communication equipment solutions generally are based on quadrature amplitude modulation (“QAM”) with equalization. This type of technology is not optimal for achieving very high data rates in obstructed signal propagation conditions with multipath. Since high data rate QAM solutions are not robust to multipath, deployment of long range, high data rate systems is limited to line-of-sight (“LOS”) scenarios -- *i.e.*, applications that account for a small fraction of the potential market for wireless computer networking and multimedia communication equipment. Some of the large markets that are not optimally served by present wireless products include campus area networking (corporate facilities, universities, hospitals, airports, etc.), high-speed metropolitan area consumer Internet connections, and high-speed wireless local loop where line-of-sight propagation is unavailable.

Clarity’s unique RF and DSP technology solves the multipath problem so that data rates from 10 Mbps to 155 Mbps can be achieved *even when line-of-sight paths are not available*. This technology opens up the possibility of deploying high-speed wireless data networks at much lower cost than with technologies that require LOS paths. Cellular and microcellular architectures, for example, can be used without the need to place antennas on tall towers. Instead, antennas can be placed in convenient, unobtrusive locations that facilitate inexpensive installations, while also providing wireless services at data rates that exceed those that can be achieved with other existing wireless products.

Clarity shares the vision expressed in the *Notice* that the MDS and ITFS bands are well suited to high-speed two-way data communications services. Furthermore, Clarity believes that the best way to provide those services is with a classic cellular or microcellular network

deployment in which a multitude of low- and medium-power base stations and remote stations are used to provide coverage to customers. Clarity's technology has been developed to advance and promote this Metropolitan Area Network ("MAN") service model for the MDS- and ITFS bands. Accordingly, Clarity has a vital interest in seeing the regulations for these bands configured to facilitate two-way wireless data operations.

II. ENABLING THE WIRELESS CABLE INDUSTRY TO EXPAND BEYOND THE CONVENTIONAL PARADIGM OF MULTICHANNEL VIDEO PROGRAMMING DISTRIBUTION IS MANIFESTLY IN THE PUBLIC INTEREST

The record in this proceeding confirms the Commission's policy judgment as to the importance and public interest benefits of two-way operation using MDS and ITFS frequencies.¹ Wireless cable operators must be permitted -- if they wish to do so -- to move beyond the one-way subscription video distribution model that has characterized existing wireless cable businesses. As with its actions to facilitate the growth and development of Local Multipoint Distribution Service ("LMDS"), the Commission here can use the MDS and ITFS spectrum to "open the door" for U.S. consumers to gain access to a wide variety of new broadband wireless services,² while at the same time provide a needed boost to the wireless cable industry in terms of greatly increased regulatory and business flexibility.

¹ Clarity notes that the Commission's actions to accelerate the deployment of advanced wireless voice, video and data services is consistent with Congressional goals articulated in the Communications Act. *See, e.g.*, 47 U.S.C. § 157 (U.S. policy to "encourage the provision of new technologies and services to the public").

² *LMDS Second Report and Order*, CC Docket No. 92-297 (rel. Mar. 13, 1997), at ¶ 2.

In order for the wireless cable industry to move beyond the status quo, Clarity believes that certain changes to the technical, regulatory, and business environment must occur. A general outline of these required changes follows below, and some more specific changes are proposed in Section III.

- *Wireless cable service providers should be accorded the flexibility to develop broadband service offerings consisting of much more than broadcast video.* While broadcast video can be an important service component for certain markets, it should not be the only focus of MDS/ITFS service offerings. Indeed, a general consensus has been reached in the wireless cable industry that high data rate, two-way Internet, voice, and interactive multimedia communications will provide important service alternatives that will substantially increase the public benefit of the MDS and ITFS frequency bands. Because these new services must be competitive with emerging DSL and two-way cable offerings, the wireless cable industry is in need of spectrum rules that will permit them to develop the equipment technology and network deployment procedures required to create successful broadband competitive local exchange carrier (“CLEC”) businesses.
- *In order to provide enough two-way data communications capacity to service MAN demand, cellular and microcellular network deployment approaches should be adopted.* The conventional MDS and ITFS deployment model, wherein transmitters and boosters provide high-ground LOS coverage to large geographic areas, will not provide sufficient frequency re-use to achieve the required two-way MAN data capacity. Cellular and microcellular deployments provide for many times the MAN capacity of high-ground LOS deployments. Without this capacity multiplying effect, there is insufficient frequency spectrum for the wireless cable industry to service enough broadband access customers to make a viable CLEC business case. The licensing rules must allow for cellular network deployments.
- *Rapid deployment of response station hubs and boosters is absolutely critical.* One of the most significant factors to allow MDS licensees to obtain reasonable CLEC market share will be the ability to promptly provide service connections to new customers. As many wireless cable operators have already learned, it is not cost effective to provide high capacity broadband access to all geographic locations in a BTA before customers commit to purchase service. The licensing rules for response station hubs and boosters must allow network operators to quickly adapt their networks to growing customer demand.
- *MDS and ITFS radio equipment solutions that enable robust broadband data communications in the presence of multipath signal propagation are critically important.* Robust performance in multipath is necessary to develop cellular and microcellular urban wireless networks that are simple and cost effective to deploy. The current generation of MDS two-way digital communication products is based largely on standard cable modem technology that is designed to work in coaxial cable deployments, not in multipath wireless applications.

This present equipment deficiency forces service providers to consider only LOS deployment scenarios that involve expensive and unsightly high altitude tower-top deployments for response station hubs. Recent developments in orthogonal frequency division multiplexing (“OFDM”) technology provide the required means for achieving very high data rates in severe multipath conditions, greatly reducing the need to place antennas on tall towers. Clarity has conducted tests of the compatibility of OFDM with television signals in the MDS/ITFS bands and will be petitioning the Commission shortly to approve OFDM for use in that band. The results of this testing show that OFDM will comply with the *Digital Declaratory Ruling* regarding the use of digital modulation.

- *The proposed rule changes will enable ITFS licensees to implement the most recent advances in broadband distance learning, conferencing, and broadband computer networking.* Aggregation of MDS and ITFS spectrum is a critical factor in providing the necessary wireless MAN data capacity to advance the CLEC business model. Simplified response station hub and booster licensing and acceptance of OFDM equipment technology will greatly enhance the value of the MDS and ITFS spectrum. This increased value should provide an incentive to wireless cable operators to provide ITFS entities with advanced technology, network maintenance services, and funding in exchange for spectrum licensing rights, which in turn will allow the ITFS entities to benefit from the most recent advances in broadband distance learning, conferencing, and computer networking. In the *Notice*, the Commission proposed rules which allow the aggregation of spectrum; those rules should be adopted.

Clarity believes that the above-described changes to the business, technical, and regulatory landscape are vital to the continued competitive development of the MDS and ITFS spectrum. Clarity offers more specific comments below with respect to aspects of rule changes proposed in the *Notice* that are particularly important to advancing this vision.

III. CLARITY FULLY SUPPORTS RULE CHANGES THAT WILL ACCELERATE THE RAPID DEVELOPMENT AND DEPLOYMENT OF TWO-WAY WIRELESS TECHNOLOGY

A. The FCC Must Adopt A Streamlined Process For New Construction And Modification Of Installations For Existing Licensees In A Manner That Will Facilitate Cellular Deployments

The need for revision of FCC’s current approach to processing applications to use the MDS and ITFS spectrum is urgent and apparent. Clarity agrees that “unless the Commission

makes radical changes in its applications processing procedures, the resulting backlogs will sound a death knell for wireless cable and its much-needed financial and operational support.”³

Business customers for wireless data services expect a high level of service and quick action on requests for new service or changes in service. An MDS licensee that adopts a cellular architecture for the provision of data services, for example, needs the flexibility to quickly install new cells and to quickly modify the frequency assignments of cells to provide new services to business customers.

New cells may be required when new customers are added in areas that were not previously within the coverage area of the licensee’s installed network. New cells may also be required when the capacity requirements of new customers exceed the capacity of existing cells.

When new cells are installed, the channels assignments for the other cells in the network frequently must be changed. Furthermore, the assignment of frequencies to cells must often be modified to optimize the performance and capacity of the network, even when new cells are not installed. If each new cell installation or each change in the frequency plan for a cellular network requires an engineering analysis to be conducted, an application for authorization to be filed, and a 60-day public notice period to be endured *before* construction is even allowed to commence, MDS licensees will be crippled in their efforts to compete with other data services, creating a barrier or disincentive to convert to digital technology.

Clarity believes that one possible solution would be for the licensee to conduct an engineering analysis for an entire Basic Trading Area (“BTA”) region where cells may be

³ WCA Comments at 18; *see also* WCA Reply Comments at 18-32.

installed. Licensees would submit a single application and engineering analysis for the entire region, and would receive FCC approval to install future cells anywhere in the region as long as the EIRP, antenna height, and total number of cells per channel is kept below the limits assumed in the analysis and application. Such a regional analysis would be every bit as effective as the current procedure with respect to protecting neighboring licensees. Moreover, a regional authorization process would still allow neighboring licensees the same 60-day public notice period to examine the analysis proposed as the rule changes proposed in the *Petition*.⁴

At a minimum, when an operator uses the currently proposed method for predicting interference and chooses to design and license a system to serve an entire region initially, the operator must be given the flexibility to make changes to the system design in the future without administrative delay. In a system with lots of closely spaced cells, it is impossible to design every detail to perfection in the initial application. Changing service demands, propagation issues, small changes in transmit site locations, difficulty in procuring leases for hub and booster sites, and many other unforeseen circumstances may force modifications to the cell design. As long as these changes do not change the potential for interference beyond those levels approved in the initial application, modification of cells should be treated by the Commission as minor with a corresponding ability by licensees to implement the changes immediately.

B. The FCC Should Ensure That The MDS and ITFS Rules Allow For Use Of Orthogonal Frequency Division Multiplexing

In 1996, the Commission predicted that “the introduction of digital technology will enhance the service of wireless cable operators by allowing opportunities for increased

⁴ See Notice, 12 FCC Rcd at 22198-199.

channel capacity and programming choices . . . and the provision of video, voice, and data services that cannot be offered currently.”⁵ That prediction is accurate. Recent developments in orthogonal frequency division multiplexing (“OFDM”) technology provide the means for wireless cable operators to achieve very high data rates in severe multipath conditions -- a development that Clarity believes will lead to revolutionary new uses for MDS and ITFS spectrum.

OFDM modulates a large number of narrowband carriers, or subcarriers, spaced closely together in frequency. Because each narrowband subcarrier sends only a few bits of data, the symbol rate is much lower than the symbol rate for a single carrier system, giving OFDM immunity from multipath induced intersymbol interference (“ISI”), even at a very high data rates. Orthogonality is achieved in OFDM by adding a time-domain cyclic prefix to each symbol so that the energy from a given subcarrier does not interfere with neighboring subcarriers. Coding is used to protect against frequency-selective fading caused by multipath.

One fundamental advantage of OFDM relative to other modulation approaches is that, regardless of the severity of multipath propagation, the received signal remains free of ISI, and no equalization processing is required. Another fundamental advantage of OFDM is that it provides very high spectral efficiency while still remaining inside required emissions masks. These advantages allow equipment to be less expensive than with other modulation schemes because the computational complexity of channel equalization is avoided. These advantages also reduce the cost of deploying network hubs. As described earlier, OFDM’s robust performance in

⁵ *Digital Declaratory Ruling*, 11 FCC Rcd 18839, 18842 (1996)(footnote omitted).

the presence of multipath means that LOS paths are not necessary and networks can be deployed without placing antennas on tall towers. Smaller, unobtrusive antenna installations can be used which are far less costly than tall-tower installations.

Clarity has conducted tests of the compatibility of OFDM with television signals in the MDS/ITFS band and will petition the Commission shortly in a separate proceeding to approve OFDM for use within that band. The results of this testing show the OFDM signal will comply with the *Digital Declaratory Ruling* regarding the use of digital modulation.⁶ The interference potential of the OFDM waveform is consistent with the interference potential of the 64-QAM and 8-VSB signals tested in the petition for the Declaratory Ruling. The OFDM signal easily complies with the 45 dB cochannel and 0 dB adjacent-channel interference protection requirements established in the *Digital Declaratory Ruling*.

Clarity urges the Commission to ensure that its rules in this proceeding do not hinder -- and indeed, affirmatively facilitate -- the introduction of OFDM as a preferred modulation approach for the wireless cable industry. The Commission has encouraged parties to "identify different digital modulation schemes that could be useful in MDS and ITFS."⁷ Clarity believes that, given the fact that multipath RF signal propagation is an inherent limitation on data rates that can be achieved today with *every* existing product technology, the introduction of OFDM into wireless cable operations could be a breakthrough of enormous benefit to industry and the consuming public.

⁶ *Digital Declaratory Ruling*, 11 FCC Rcd 18839 (1996).


⁷ *Notice* 12 FCC Rcd at 22187-88, ¶ 30.

IV. CONCLUSION

Clarity supports the Commission's efforts to facilitate the use of MDS and ITFS spectrum for innovative two-way communications services. Consistent with this objective, Clarity requests that the Commission's rule changes specifically accommodate the goals and concerns set forth above.

Respectfully submitted,

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